



Exampro GCSE Biology

B2.5 Inheritance
Higher tier

Name:

Class:

Author:

Date:

Time: 90

Marks: 90

Comments:

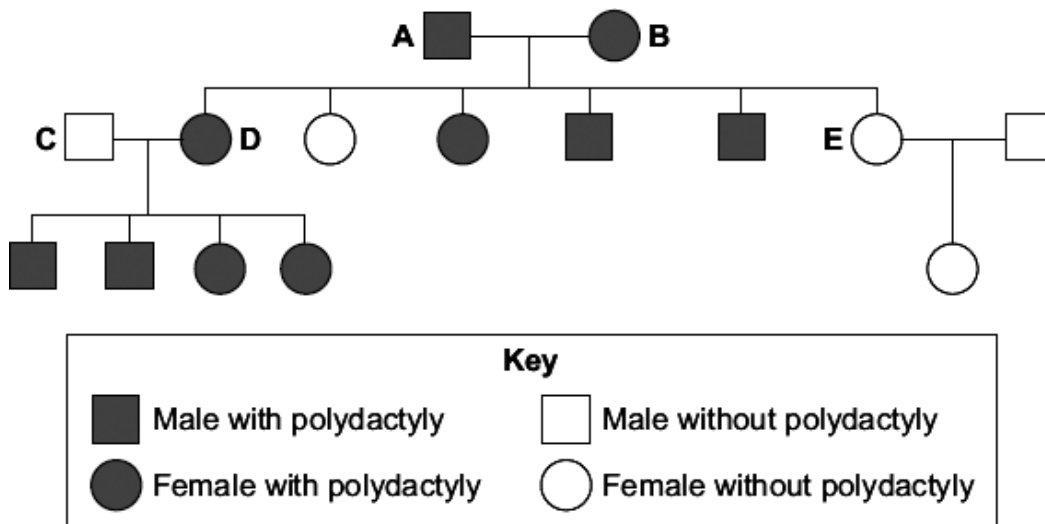
Q1. Cats normally have four toes on each back paw.

The picture shows the back paw of a cat with an inherited condition called polydactyly.



By Onyxrain (Own work) [Public domain], via Wikimedia Commons

The family tree shows the inheritance of polydactyly in three generations of cats.



(a) What combination of alleles did the original parents, **A** and **B**, have?

Explain how you work out your answer.

You may use a genetic diagram in your answer.

Use the symbol **H** to represent the dominant allele.

Use the symbol **h** to represent the recessive allele.

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A = **B** =

(4)

(b) (i) Give **two** possible combinations of alleles for cat **D**.

1 2

(1)

(ii) You cannot be sure which one of these two is the correct combination of alleles for cat **D**.

Why?

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.....
.....

(1)

(Total 6 marks)

Q2.

(a) Mr and Mrs Smith both have a history of cystic fibrosis in their families.

Neither of them has cystic fibrosis.

Mr and Mrs Smith are concerned that they may have a child with cystic fibrosis.

Use a genetic diagram to show how they could have a child with cystic fibrosis.

Use the symbol **A** for the dominant allele and the symbol **a** for the recessive allele.

(3)

(b) Mr and Mrs Smith decided to visit a genetic counsellor who discusses embryo screening.

Read the information which they received from the counsellor.

- Under an anaesthetic five eggs will be removed from Mrs Smith's ovary.
- The eggs will be fertilised in a dish using Mr Smith's sperm cells.
- The embryos will be grown in the dish until each embryo has about thirty cells.
- One cell will be removed from each embryo and tested for cystic fibrosis.
- A suitable embryo will be placed into Mrs. Smith's uterus and she may become pregnant.
- Any unsuitable embryos will be killed.

(i) Suggest why it is helpful to take five eggs from the ovary, rather than just one.

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(1)

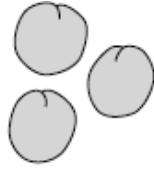
(ii) Evaluate the use of embryo screening in this case.

Remember to give a conclusion as part of your evaluation.

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(4)
(Total 8 marks)

Q3. In the 1860s, Gregor Mendel studied inheritance in nearly 30 000 pea plants. Pea plants can produce either round seeds or wrinkled seeds.



Round pea seeds



Wrinkled pea seeds

- (a) Mendel crossed plants that always produced round seeds with plants that always produced wrinkled seeds.

He found that all the seeds produced from the cross were round.

Use the symbol **A** to represent the dominant allele and **a** to represent the recessive allele.

Which alleles did the seeds from the cross have?

(1)

- (b) Mendel grew hundreds of plants from the seeds of the offspring. He crossed these plants with each other.

- (i) Mendel's crosses produced 5496 round pea seeds and 1832 wrinkled pea seeds.

Explain why Mendel's crosses gave him these results.

In your answer you should use:

- a genetic diagram
- the symbols **A** and **a**.

(3)

(ii) One of Mendel's crosses produced 19 round seeds and 16 wrinkled seeds.
These numbers do **not** match the expected ratio of round and wrinkled seeds.
Suggest why.

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(1)

(c) The importance of Mendel's discovery was not recognised until many years after his death.

Give **one** reason why.

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(1)
(Total 6 marks)

Q4. Cystic fibrosis and Huntington's disease are inherited disorders.

(a) Someone can be a carrier of cystic fibrosis.

Explain how.

You may include a genetic diagram in your answer.

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(2)

(b) Why does only one parent need to have the Huntington's disease allele for a child to inherit Huntington's disease?

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.....

(1)
(Total 3 marks)

Q5. A certain allele increases the chance of women developing one type of breast cancer.

A woman has this allele. She wants to be sure that she will not have daughters who also have the allele.

Doctors:

- collect several eggs from her ovaries
- fertilise the eggs with sperm, in dishes.

(a) The doctors expect half the embryos produced to be female.

Explain why.

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(2)

(b) The embryos grow to around 100 cells.

Doctors:

- remove one cell from each embryo
- check the cell for the allele.

Complete the sentence.

This process is known as embryo

(1)

- (c) One of the female embryos did not have the allele.
This female embryo was implanted into the woman's uterus.

Evaluate the advantages and disadvantages of the whole procedure.

Use information from all parts of this question and your own knowledge.

Remember to give a conclusion to your evaluation.

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(4)
(Total 7 marks)

Q6. The photographs show the flowers of two closely-related species of plant.

Species A



Species B



Images: © iStock/Thinkstock

The drawings show chromosomes from one cell in the root of each plant during cell division.

Species A



**One
chromosome**

Species B



**One
chromosome**

(a) The drawings show that each chromosome has two strands of genetic material.

(i) How does a chromosome become two strands?

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.....

(1)

(ii) Explain why each chromosome must become two strands before the cell divides.

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(2)

(b) For sexual reproduction, the plants produce gametes.

(i) Name the type of cell division that produces gametes.

.....

(1)

(ii) How many chromosomes would there be in a gamete from each of these two plant species?

Species A

Species B

(1)

(iii) It is possible for gametes from **Species A** to combine with gametes from **Species B** to produce healthy offspring plants.

How many chromosomes would there be in each cell of one of the offspring

plants?

(1)

(c) (i) Look back at the information at the start of the question and the information from part (b).

What evidence from these two pieces of information supports the belief that **Species A** and **Species B** evolved from a common ancestor?

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(2)

- (ii) For successful gamete production to take place, chromosomes that contain the same genes must pair up.

The drawings showing the chromosomes of **Species A** and of **Species B** are repeated below.



The offspring plants cannot reproduce sexually.

Suggest an explanation for this.

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(2)
(Total 10 marks)

Q7. People with cystic fibrosis make large amounts of thick, sticky mucus in their lungs. Cystic fibrosis is caused by the inheritance of recessive alleles.

(a) What do each of the following mean?

(i) Alleles

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.....

(1)

(ii) Recessive

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.....

(1)

- (b) Mr and Mrs Brown have a child with cystic fibrosis. They hope to have another child. They want to know the probability that their next child will have cystic fibrosis. They visit a genetic counsellor who explains, "You are both heterozygous for cystic fibrosis. There is a 1 in 4 (25%) chance that your next child will have cystic fibrosis."

Use the following symbols in answering the questions.

N = allele for being unaffected by cystic fibrosis

n = allele for cystic fibrosis

- (i) Mr and Mrs Brown both have the same genotype.

What is their genotype?

(1)

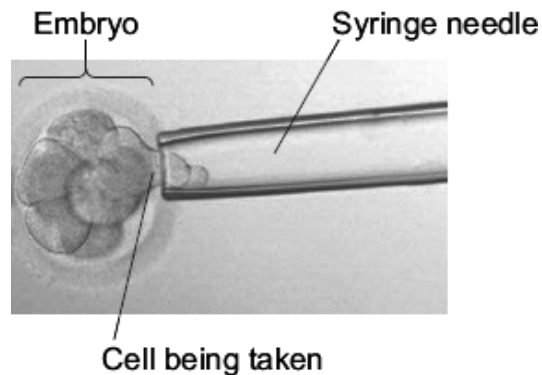
- (ii) There is a 1 in 4 chance that Mr and Mrs Brown's next child will have cystic fibrosis. Use a genetic diagram to explain why.

(3)

- (c) Mr and Mrs Brown do **not** want to have another child with cystic fibrosis. The genetic counsellor explains two different methods for finding out whether an embryo has cystic fibrosis. The methods are:

- pre-implantation genetic diagnosis (**PGD**)
- chorionic villus sampling (**CVS**).

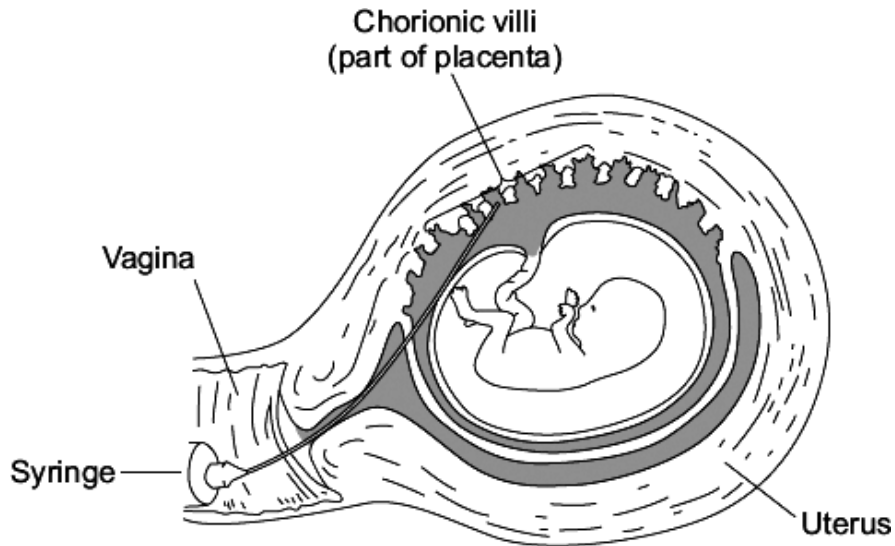
In **PGD**, eggs are fertilised in dishes and allowed to grow into embryos. A cell is taken from each embryo when the embryo is 3 days old. The photograph shows how the cell is taken.



Photograph: © Pascal Goetgheluck/
Science Photo Library

The DNA in the cell can then be tested. The possibility of a false positive result is about 1 in 6. An unaffected embryo can then be placed in the woman's uterus. The procedure costs about £6000.

CVS can only be done after 9 weeks of pregnancy. A tiny piece of the placenta is taken out using a tube attached to a syringe. This is grown in tissue culture for about 7 days. The diagram below shows how **CVS** is done.



The DNA in the cells can then be tested. About 2 in every 100 women have a miscarriage because of **CVS**. The possibility of a false positive result is about 1%. The procedure costs about £600. Following a positive result, the parents must then decide whether to terminate the pregnancy.

The genetic counsellor thinks that **PGD** is a better method than **CVS** for detecting cystic fibrosis in an embryo.

Evaluate this opinion.

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(4)
(Total 10 marks)

Q8. Read the information about stem cells.

Stem cells are used to treat some human diseases.

Stem cells can be collected from early embryos. These stem cells have not begun to differentiate, so they could be used to produce any kind of cell, tissue or organ. The use of embryonic stem cells to treat human diseases is new and, for some diseases, trials on patients are happening now.

Stem cells can also be collected from adult bone marrow. The operation is simple but may be painful. Stem cells in bone marrow mainly differentiate to form blood cells. These stem cells have been used successfully for many years to treat some kinds of blood disease. Recently there have been trials of other types of stem cell from bone marrow. These stem cells are used to treat diseases such as heart disease.

Evaluate the use of stem cells from embryos or from adult bone marrow for treating human diseases.

You should give a conclusion to your evaluation.

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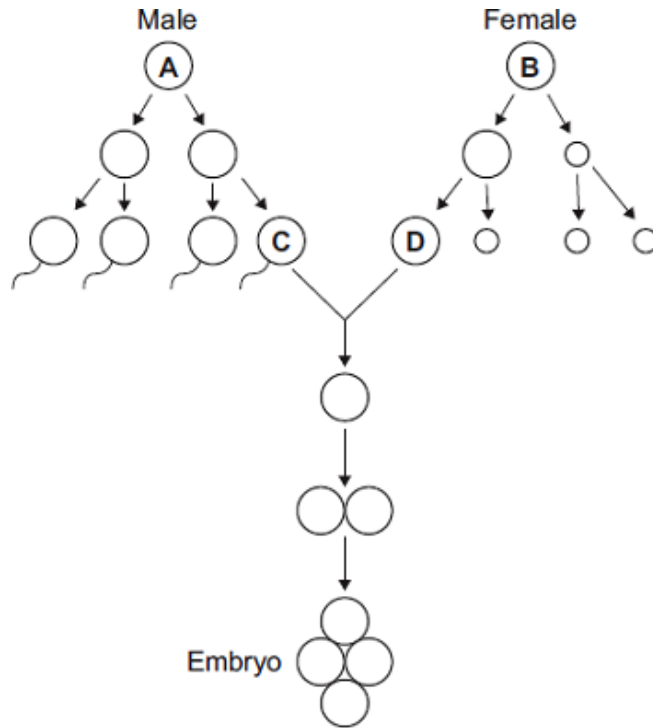
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(5)
(Total 5 marks)

Q9. The diagram shows some of the cell divisions that occur during human reproduction.



(a) (i) Name the type of cell division that produces cell **D** from cell **B**.

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(1)

(ii) Which organ in the male body produces cell **C** from cell **A**?

.....

(1)

(b) (i) Cells **A** and **B** each contain 46 chromosomes.

How many chromosomes would there be in the nucleus of cell **C**?

(1)

(ii) Why is it important that cell **C** has this number of chromosomes?

.....

(2)

(Total 5 marks)

Q10. A certain gene codes for the production of an enzyme called 'HEXA'.

One human genetic disorder causes damage to nerve cells in the brain.
This disorder is caused by a small change in the DNA of the HEXA gene.
People with this disorder make a changed HEXA enzyme that does not work.

(a) Explain how a change in the DNA of the HEXA gene can result in the production of a changed HEXA enzyme that does not work.

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(3)

(b) The gene coding for the HEXA enzyme is found on chromosome number 15.

(i) How many chromosomes are there in the nucleus of a human nerve cell?

(1)

(ii) A boy had the changed HEXA gene on the chromosome number 15 that he inherited from his father.
The changed HEXA gene coded for a HEXA enzyme that does not work.
The boy did **not** develop the genetic disorder.

Explain why the boy did **not** develop the genetic disorder.

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(2)

(iii) The boy grew up and got married.

A blood test showed that his wife had also inherited the same changed HEXA gene.

There is a 1 in 4 chance that this couple's first child will have the genetic disorder.

Use a genetic diagram to explain why.

Use the following symbols in your explanation:

H = allele for making the normal HEXA enzyme

h = allele for making a HEXA enzyme that does not work.

(3)
(Total 9 marks)

Q11. (a) Mr and Mrs Smith both have a history of cystic fibrosis in their families.

Neither of them has cystic fibrosis.

Mr and Mrs Smith are concerned that they may have a child with cystic fibrosis.

Use a genetic diagram to show how they could have a child with cystic fibrosis.

Use the symbol **A** for the dominant allele and the symbol **a** for the recessive allele.

(3)

(b) Mr and Mrs Smith decided to visit a genetic counsellor who discussed embryo screening.

Read the information which they received from the genetic counsellor.

- Five eggs will be removed from Mrs Smith's ovary while she is under an anaesthetic.
- The eggs will be fertilised in a dish using Mr Smith's sperm cells.
- The embryos will be grown in the dish until each embryo has about thirty cells.
- One cell will be removed from each embryo and tested for cystic fibrosis.
- A suitable embryo will be placed into Mrs Smith's uterus and she may become pregnant.
- Any unsuitable embryos will be destroyed.

(i) Suggest why it is helpful to take five eggs from the ovary and not just one egg.

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(1)

(ii) Evaluate the use of embryo screening in this case.

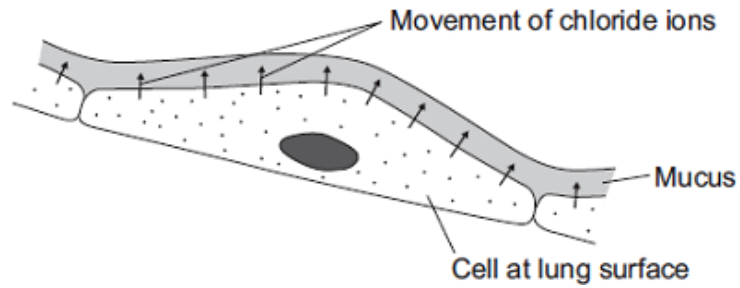
Remember to give a conclusion to your evaluation.

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(4)

(c) In someone who has cystic fibrosis the person's mucus becomes thick.

The diagram shows how, in a healthy person, cells at the lung surface move chloride ions into the mucus surrounding the air passages.



The movement of chloride ions causes water to pass out of the cells into the mucus.

Explain why.

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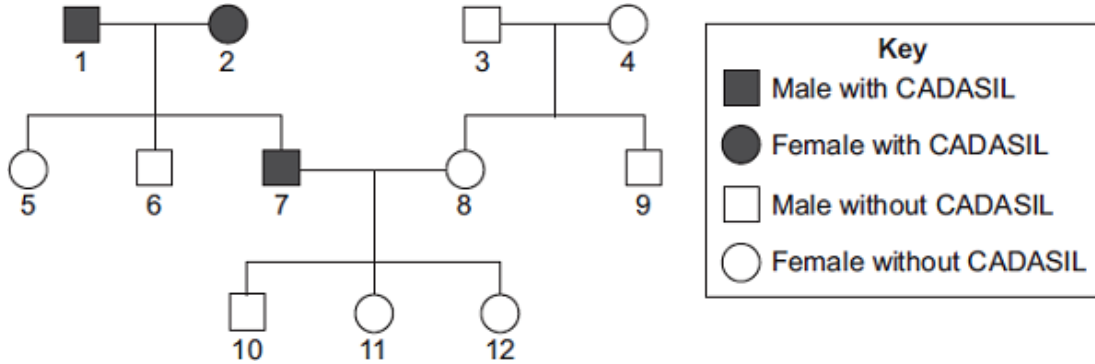
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(3)
(Total 11 marks)

Q12. CADASIL is an inherited disorder caused by a dominant allele.

CADASIL leads to weakening of blood vessels in the brain.

The diagram shows the inheritance of CADASIL in one family.



(a) CADASIL is caused by a *dominant allele*.

(i) What is a *dominant allele*?

.....

(1)

(ii) What is the evidence in the diagram that CADASIL is caused by a dominant allele?

.....

(1)

(iii) Person 7 has CADASIL.

Is person 7 homozygous or heterozygous for the CADASIL allele?

Give evidence for your answer from the diagram.

.....

(1)

- (b) Persons **7** and **8** are planning to have another baby.
Use a genetic diagram to find the probability that the new baby will develop into a person with CADASIL.

Use the following symbols to represent alleles.

D = allele for CADASIL

d = allele for not having CADASIL

Probability =

(4)

- (c) Scientists are trying to develop a treatment for CADASIL using stem cells.
Specially treated stem cells would be injected into the damaged part of the brain.

- (i) Why do the scientists use stem cells?

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(2)

- (ii) Embryonic stem cells can be obtained by removing a few cells from a human embryo. In 2006, scientists in Japan discovered how to change adult skin cells into stem cells. Suggest **one** advantage of using stem cells from adult skin cells.

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.....

(1)

(Total 10 marks)

M1. (a) **A = Hh B = Hh**
may not be in answer space
accept heterozygous or description 1

(allele for) polydactyly is dominant **or** polydactyly is H,
for marking points 1, 2 and 3 accept evidence in clearly labelled /
annotated genetic diagram 1

cats with polydactyly have H
accept if polydactyly was recessive all offspring would have
polydactyly 1

E or (some) offspring of **A** and **B**, does not have polydactyly,
so **A** and **B** must both have h 1

(b) (i) **HH and Hh or**
homozygous dominant **and** heterozygous
both required, in either order
allow description 1

(ii) any **one** from:
accept annotated genetic diagram to explain answer

- polydactyly is dominant
- parents are both Hh
- if D is Hh all offspring could inherit H

1

[6]

M2. (a) both parents **Aa**
accept other upper and lower case letters without key or symbols
with a key
allow shown as gametes in punnet square 1

aa in offspring correctly derived from parents /
aa correctly derived from the parents given
ignore other offspring / gametes for this mark parents do not have
to be correct 1

offspring **aa** identified as having cystic fibrosis
*may be the only offspring shown **or** circled / highlighted / described* 1

(b) (i) any **one** from:

accept converse if clear eg if you (only) took one it might have cystic fibrosis / might not be fertilised

- sure / greater chance of healthy / non-cystic fibrosis egg / embryo /child
accept some may have the allele
reference to suitable embryo is insufficient
- greater chance of fertilisation

1

(ii) **to gain 3 marks both advantages and disadvantages must be given**

advantages

any **two** from

ignore references to abortion unless qualified by later screening

- greater / certain chance of having child / embryo without cystic fibrosis / healthy
- child with cystic fibrosis difficult / expensive to bring up
- cystic fibrosis (gene / allele) not passed on through generations

disadvantages

any **two** from:

- operation dangers eg infection
ignore risk unqualified
- ethical or religious issues linked to killing embryos
accept wrong / cruel to kill embryos accept right to life
- (high) cost
- possible damage to embryo (during testing for cystic fibrosis / during operation)

3

plus

conclusion

a statement that implies a valued, qualified judgement

eg it is right because the risk of infection is small

or

eg it is wrong because embryos are killed

Note: *the conclusion mark cannot be given unless a reasonable attempt to give both an advantage and a disadvantage has (already) been made*

*do **not** award the mark if the conclusion only states that advantages outweigh disadvantages*

1

[8]

- M3.** (a) Aa
*allow dominant **and** recessive*
allow heterozygous 1
- (b) (i) gametes A, a **and** A, a
max 1 if gametes are incorrect (eg in punnet square) 1
- correctly derived offspring from cross
allow ecf from their gametes 1
- identification of round **and** wrinkled offspring
for this mark the phenotype of each different offspring genotype must be indicated 1
- (ii) (due to) chance **or** expected ratio is only a probability
accept the idea of small numbers not representative
ignore anomaly / random / coincidence
*do **not** accept error* 1
- (c) any **one** idea from:
- genes / chromosomes / alleles / DNA not discovered / known about
*do **not** accept religious theme (ie confusion with Darwin's difficulties with the church)*
 - published in obscure journal / few scientists read his work 1

[6]

- M4.** (a) cystic fibrosis (allele / gene) recessive
allow an annotated genetic diagram 1
- carrier has only one cystic fibrosis allele / gene
accept carrier is heterozygous
accept any symbol with key or
accept conventional use of symbols
penalise use of chromosome once only 1

(b) any **one** from:

- Huntington's (allele / gene) dominant
- (to have Huntington's) need only one Huntington's allele / gene

1

[3]

M5. (a) half / 50% sperm have X (chromosome)

or

half / 50% sperm have Y (chromosome)

penalise incorrect use of gene / allele once only

1

all eggs have X (chromosome)

*annotated genetic diagram could gain **2 marks***

1

(b) screening

ignore selection

1

(c) any **three** from:

*max 2 if only advantages **or** only disadvantages discussed*

advantages:(**max 2**)

- (girl / children / women) don't / less likely to get / inherit (breast) cancer / this / the disease
*do **not** accept reference to allele alone for this point*
- future generations get less cancer **or** less likely to have the allele
- less expensive (for NHS) than treating cancer

disadvantages:(**max 2**)

- (wrong / immoral to) reject / kill embryos
ignore wrong / immoral / religious argument unqualified
- possible harm to embryo (that is implanted) / miscarriage
ignore reference to termination
- possible harm to mother (due to operational procedure)
allow reference to needing hormone treatment

3

argued conclusion

*must refer to **both** advantages and disadvantages and must be at end of answer*

1

[7]

- M6.** (a) (i) DNA replication / copies of genetic material were made
'it' = a chromosome
allow chromosomes replicate / duplicate / are copied
ignore chromosomes divide / split / double 1
- (ii) one copy of each (chromosome / chromatid / strand) to each offspring cell
ignore ref. to gametes and fertilisation 1
- each offspring cell receives a complete set of / the same genetic material
allow 'so offspring (cells) are identical' 1
- (b) (i) meiosis
allow mieosis as the only alternative spelling 1
- (ii) Species A = 4 **and** Species B = 8 1
- (iii) sum of A + B from (b)(ii) e.g. 12 1
- (c) (i) similarities between chromosomes
or
 similarities between flowers described
e.g. shape of petals / pattern on petals / colour / stamens 1
- can breed / can sexually reproduce
allow can reproduce with each other / they can produce offspring 1
- (ii) any **two** from:
- offspring contain 3 copies of each gene / of each chromosome / odd number of each of the chromosomes
 - some chromosomes unable to pair (in meiosis)
 - (viable) gametes not formed / some gametes with extra / too many genes / chromosomes
- or**
 some gametes with missing genes / chromosomes 2
- [10]**
- M7.** (a) (i) (alternative) forms / types of a / the same gene 1
- (ii) only expressed if 2 copies inherited
or not expressed if other allele present
allow over ruled / over powered by the other allele 1

- (b) (i) **Nn**
ignore heterozygous 1
- (ii) genetic diagram including:
accept alternative symbols, if defined
- gametes: **N** and **n** from both parents
accept alternative symbols if correct for answer to (b)(i) 1
- correct derivation of offspring genotypes:
NN Nn Nn nn
allow if correct for candidate's parental genotypes / gametes 1
- identification of **nn** as having cystic fibrosis 1
- (c) **Argued evaluation**
- any **four** from:
- PGD higher financial cost
accept CVS only costs £600
 - PGD occurs before pregnancy / implantation
accept detected at earlier stage so less unethical / less trauma
 - PGD does not involve abortion so less trauma / less pain / ethical • PGD higher incidence of false positive / use of numbers so higher risk of destroying healthy embryo
accept PGD has (surplus) embryos so some destroyed / unethical
 - PGD no chance of miscarriage whereas CVS does
or PGD less chance of miscarriage
- 4

[10]

M8. Marks should **not** be awarded for simply copying the information provided
A mark may be awarded for a comparison between treatments if the answer only involves copied information

any **four** from:

For all 4 marks to be awarded, there must be at least 1 pro and 1 con

embryo stem cells – examples of

pros

- can treat a wide variety / lots of diseases / problems
- many available / plentiful
- using them better than wasting them
- painless

cons

- (possible) harm / death to embryo
- (relatively) untested / unreliable / may not work
*allow long term effects not known
or may be more risky*
- embryo can't be 'asked' / 'embryo rights' idea

adult bone marrow stem cells – examples of

pros

- no ethical issues (in collection) **or** permission given
- quick recovery
- (relatively) safe
allow does not kill (donor) / low risk
- well tried / tested / know they work

cons

- operation hazards eg infection
- few types of cell / tissue produced **or** few diseases / problems treated
- painful so may deter donors

4

Conclusion to evaluation:

A reasoned conclusion from the evidence

1

[5]

- M9.** (a) (i) meiosis
allow mieosis 1
- (ii) testis / testes
allow testicle 1
- (b) (i) 23 1
- (ii) fuses / joins with cell D / with egg cell **or** used in fertilisation
allow fuse with another cell 1
- prevents doubling of chromosome number / restores original no. / 46 / diploid no. / normal no. / full no.
accept 23 from each parent / from each gamete 1
- [5]
- M10.** (a) changes code /sequences of bases
or
sequence of amino acids is different 1
- the enzyme has different / wrong shape / structure
allow the active site is changed 1
- so substrate will not fit into enzyme / will not join to enzyme 1
- (b) (i) 46
allow 23 pairs 1
- (ii) also inherited (from mother) normal chromosome 15 / normal allele / normal gene / boy is heterozygous / **Hh**
allow the boy is a carrier 1
- (allele for) this disorder is recessive
or
the normal allele would give a working enzyme
ignore converse 1
- (iii) genetic diagram including:
Parental gametes:
H and **h** from both parents
accept alternative symbols, if defined 1

derivation of offspring genotypes:

HH Hh Hh hh

allow alternative if correct for student's parental genotypes / gametes

1

identification of **hh** (having the disorder) if 1 in 4

1

[9]

M11. (a) both parents **Aa**

*accept other upper and lower case letter without key **or** symbols with a key*

allow as gametes shown in Punnett square

1

aa in offspring correctly derived from parents

or

aa correctly derived from the parents given

ignore other offspring / gametes

for this mark parents do not have to be correct

1

offspring **aa** identified as having cystic fibrosis

*may be the only offspring shown **or** circled / highlighted / described*

1

(b) (i) any **one** from:

accept converse if clear, eg if you (only) took one it might have cystic fibrosis / might not be fertilised

- (more) sure / greater chance of healthy / non-cystic fibrosis egg / embryo / child

accept some may have the allele

reference to 'suitable / good embryo' is insufficient

- greater chance of fertilisation

1

(ii) **advantages**

to gain 3 marks both advantage(s) and disadvantage(s) must be given

max 3

any **two** from:

ignore references to abortion unless qualified by later screening

- greater / certain chance of having child / embryo without cystic fibrosis / healthy
- child with cystic fibrosis difficult / expensive to bring up
- cystic fibrosis (gene / allele) not passed on to future generations

disadvantages

any **two** from:

- operation dangers / named eg infection
ignore risk unqualified
- ethical or religious issues linked with killing embryos
accept wrong / cruel to embryos accept right to life argument
ignore embryos are destroyed
- (high) cost of procedure
- possible damage to embryo (during testing for cystic fibrosis / operation)

plus

conclusion

a statement that implies a qualified value judgement

eg it is right because the child will (probably) not have cystic fibrosis even though it is expensive

or

eg it is wrong because embryos are killed despite a greater chance of having a healthy baby

note: *the conclusion mark cannot be given unless a reasonable attempt to give both an advantage and a disadvantage is made*
*do **not** award the mark if the conclusion only states that advantages outweigh the disadvantages*

(c) any **three** from:

- osmosis / diffusion
*do **not** accept movement of ions / solution by osmosis / diffusion*
- more concentrated solution outside cell / in mucus
assume concentration is concentration of solute unless answer indicates otherwise or accept correct description of 'water concentration'
- water moves from dilute to more concentrated solution
allow correct references to movement of water in relation to concentration gradient
- partially permeable membrane (of cell)
allow semi / selectively permeable

3

[11]

M12. (a) (i) allele expressed even when other allele present **or** expressed if just one copy of allele is present **or** expressed if heterozygous
if present other allele not expressed

1

(ii) 2 affected parents have unaffected child **or** 1 and 2 → **5 / 6**
or if recessive all of **1** and **2**'s children would have CADASIL

1

(iii) heterozygous – has unaffected children **or** because if homozygous all children would have CADASIL

1

(b) genetic diagram including:
accept alternative symbols, if defined

1

correct gametes:

D and **d**
and d (and **d**)
ignore 7 / 8 or male / female

1

derivation of offspring genotypes:

Dd Dd dd dd
*allow just **Dd dd** if ½-diagram*
allow ecf if correct for student's gametes

1

identification **of Dd** as CADASIL
or dd as unaffected
allow ecf if correct for student's gametes

1

correct probability: 0.5 / ½ / 1 in 2 / 50% / 1 : 1

1

(c) (i) stem cells can differentiate **or** are undifferentiated / unspecialised

1

can form blood vessel cells / brain cells

or

stem cells can divide

1

(ii) ethical argument - eg no risk of damage to embryo or adult can give consent for removal of cells **or** adult can re-grow skin

more ethical qualified

ignore religion unqualified

or

if from a relative then less chance of rejection **or** if from self then no chance of rejection

or

skin cells more accessible

1

[10]

